

stream habitat conditions due to the substantial buffer between the developed areas and the stream. There have not been significant alterations to the subbasin, stream channel, or riparian habitat.

State of the Subbasin

Shinglemill Subbasin 2 remains in good condition. The only significant alteration has been to the landscape from agricultural and rural residential development. However, this alteration has had minimal impacts on the stream.

7.8 SHINGLEMILL SUBBASIN 3 STREAM HABITAT CLASSIFICATION

7.8.1 General Characteristics

Shinglemill Subbasin 3 consists of a forested landscape with a mix of rural residential and agricultural development, and contains the main stem of Shinglemill Creek and six small tributaries (Figure 7-1). The total length of Class 2 stream is 5,000 feet. The Vashon Municipal Airport is a notable feature in the subbasin. Shinglemill Creek is a moderate-gradient contained channel type and the tributaries are all high-gradient contained channel types (Figure 7-3).

7.8.2 Subbasin Alteration

Effective Impervious Area

Shinglemill Subbasin 3 is 419 acres in size and has 5 acres of impervious area, yielding a 1percent impervious area, a low level of alteration.

Landscape Alteration

Prior to development, 418 acres of mature forested land cover was present in Shinglemill Subbasin 3. Currently, 331 acres of forested land cover remain in the subbasin, 79 percent of the historical area, a low level of alteration.

Impact from Culverts and other Crossings

There are no culverts or stream crossings in Shinglemill Subbasin 3.

Flow Modification

The hydrologic analysis indicates a low level of flow modification ($Q2_{\text{post}}/Q2_{\text{pre}} < 1.25$) in Shinglemill Subbasin 3 (Table 7-20).

TABLE 7-20. PRE-DEVELOPED AND POST-DEVELOPED 2-YEAR FLOWS AND RATIO; RCHRES SEGMENT 300 IN SHINGLEMILL SUBBASIN 3	
$Q2_{\text{pre}}$	50 cfs
$Q2_{\text{post}}$	61 cfs
$Q2_{\text{post}}/Q2_{\text{pre}}$ ratio	1.21

Channel Modification and Floodplain Connectivity

The stream channel is in good condition, with little visible impact on the stream channel or floodplain connectivity. There is development in the form of agriculture/grazing, rural residential development, and the Vashon airport in this subbasin, but the wide buffer surrounding the stream has minimized the impacts of these alterations. Floodplain connectivity remains in good condition.

Riparian Alteration

In Shinglemill Subbasin 3, 98 percent of the riparian corridor is forested (39 of the 40 acres), a low level of alteration. There are no riparian breaks, indicating a low level of alteration to the longitudinal integrity of the riparian corridor. The overall riparian alteration rating is low, due to the low level of alteration indicated by both metrics.

Subbasin Alteration Matrix

A low level of alteration to the Shinglemill Subbasin 3 has occurred (see Table 7-21). Agricultural and rural residential development have occurred in the subbasin, but have not encroached on or significantly impacted the stream habitat, as indicated by the low levels of impact for all criteria.

7.8.3 Benthic Biodiversity

No B-IBI data have been collected for Shinglemill Subbasin 3.

7.8.4 Subbasin Summary

Field Investigation and Verification

Habitat conditions in Shinglemill Subbasin 3 were assessed directly upstream of the confluence with Needle Creek. Fish passage was rated as “good” in this reach, as there were no barriers. The riparian habitat was in “good” condition and dominated by deciduous trees. The substrate in spawning areas was not embedded, dominated by gravels and in “good” condition. The channel pattern was sinuous and in “good” condition. Both LWD and pool frequencies were “good.”

TABLE 7-21. SUBBASIN ALTERATION MATRIX FOR SHINGLEMILL SUBBASIN 3			
Criteria	Level of Alteration		
	High	Moderate	Low
Effective Impervious Area			1% EIA
Landscape Alteration			79% forested
Impact from Culverts and Other Stream Crossings			0 stream crossings
Flow Modification ($Q2_{\text{post}}/Q2_{\text{pre}}$ ratio)			1.21
Channel Modifications and Floodplain Connectivity			No modification
Riparian Alteration			98% forested 0 riparian breaks

Habitat Value

Shinglemill Subbasin 3 is a high value area with abundant salmonid spawning and rearing habitat. Although there are no significant tributaries containing fish habitat, the subbasin has a high production potential due to the high stream channel and habitat complexity.

Rating

Shinglemill Subbasin 3 remains in “good” condition due to the extremely limited encroachment of development on the stream corridor. The potential salmonid production in this subbasin is high due to the abundant LWD, creating high stream channel and habitat complexity and frequent pools.

State of the Subbasin

Shinglemill Creek remains in good condition in Subbasin 3 despite development surrounding the stream. The steep ravine that contains the stream channel has protected the stream from development, preserving the riparian and stream habitat conditions. The stream channel represents pristine habitat conditions for Vashon Island streams, thus the integrity of this subbasin should be maintained.

7.9 SHINGLEMILL SUBBASIN 4 STREAM HABITAT CLASSIFICATION

7.9.1 General Characteristics

Shinglemill Subbasin 4 is the largest of the Shinglemill Creek subbasins and contains the headwaters of Shinglemill Creek (Figure 7-1). The stream is a moderate-gradient mixed-control channel type that flows from Fisher’s Pond in the upper reaches down to the head of Shinglemill Subbasin 3 (Figure 7-3). The total length of Class 2 stream is approximately 5,200 feet. The landscape consists of forested areas, rural residential development, and agricultural lands.

7.9.2 Subbasin Alteration

Effective Impervious Area

Shinglemill Subbasin 4 is 801 acres in size and has 22 acres of EIA, yielding a 3-percent EIA, a low level of alteration.

Landscape Alteration

Prior to development, 801 acres of mature forested land cover was present in Shinglemill Subbasin 4. Currently, 491 acres of forested land cover remain in the subbasin, 61 percent of the historical area, a high level of alteration.

Impact from Culverts and other Crossings

Shinglemill Subbasin 4 has four culverts, yielding 3.1 stream crossings per mile, a moderate level of alteration. There are no fish passage barriers in the subbasin.

Flow Modification

The hydrologic analysis indicates a low level of flow modification ($Q2_{\text{post}}/Q2_{\text{pre}} < 1.25$) in Shinglemill Subbasin 4 (Table 7-22).

TABLE 7-22.
PRE-DEVELOPED AND POST-DEVELOPED 2-YEAR
FLOWS AND RATIO; RCHRES SEGMENT 400 IN
SHINGLEMILL SUBBASIN 4

Q _{2pre}	40 cfs
Q _{2post}	49 cfs
Q _{2post} /Q _{2pre} ratio	1.22

Channel Modification and Floodplain Connectivity

The stream channel and flow alterations in Shinglemill Subbasin 4 have been minimal; the only modifications are at road crossings where the stream is confined by culverts. Road crossings are the only obstruction to floodplain connectivity in the subbasin.

Riparian Alteration

In Shinglemill Subbasin 4, 80 percent of the riparian corridor is forested (28 of the 35 acres), a moderate level of alteration. There are 5 riparian breaks, yielding 5.0 riparian breaks per mile, a moderate level of alteration to the longitudinal integrity of the riparian corridor. The overall riparian alteration rating is moderate due to the moderate level of alteration indicated by both metrics.

Subbasin Alteration Matrix

A moderate level of subbasin alteration has occurred in Shinglemill Subbasin 4 (see Table 7-23), due to the high level of landscape alteration, and the moderate levels of stream crossings and riparian alteration. The impervious area, channel modification, and flow modifications are at a low level of alteration. This analysis indicates that development in the subbasin has significantly altered the landscape, created road crossings, and encroached on the riparian habitat, threatening the integrity of the subbasin.

TABLE 7-23.
SUBBASIN ALTERATION MATRIX FOR SHINGLEMILL SUBBASIN 4

Criteria	Level of Alteration		
	High	Moderate	Low
Effective Impervious Area			3% EIA
Landscape Alteration	61% forested		
Impact from Culverts and Other Stream Crossings		3.1 crossings/mile	
Flow Modification (Q _{2post} /Q _{2pre} ratio)			1.22
Channel Modifications and Floodplain Connectivity			<10% of the stream length is altered
Riparian Alteration		80% forested	

7.9.3 Benthic Biodiversity

No B-IBI data have been collected for Shinglemill Subbasin 4.

7.9.4 Subbasin Summary

Field Investigation and Verification

Habitat conditions in Shinglemill Subbasin 4 were assessed at the SW Cove Road crossing. Fish passage was in “good” condition with no impairment by culverts. The riparian habitat was “fair” and encroached on by clearings for a power line that follows the stream in this reach. The substrate in spawning areas was “good” and dominated by small gravels, and embeddedness was “low”. Stream banks were well vegetated and in “good” condition. The channel pattern/bedform was “fair” with moderate sinuosity. Pools frequency was “good” and LWD quantity was “fair.”

Habitat Value

Shinglemill Subbasin 4 contains the headwaters of Shinglemill Creek, and is of moderate habitat value. Potential anadromous salmonid production in this reach is probably limited by the small stream size in this reach. However, the subbasin is probably important habitat for resident fishes.

Rating

The stream habitat in Shinglemill Subbasin 4 is in “fair” condition due to the moderate level of alteration to the riparian habitat. However, the stream channel remains in good condition and there is a diversity of habitats and abundant pools.

State of the Subbasin

Shinglemill Creek remains in relatively good condition in Subbasin 4 despite moderate alteration from the development surrounding the stream. Intermittent riparian removal of the riparian habitat is the most significant habitat impairment in the subbasin. Restoration of the riparian habitat in this subbasin should be a habitat improvement priority. Additional development could lead to further degradation of the riparian habitat and potentially impact in-stream conditions.

7.10 OVERALL BASIN SUMMARIES

7.10.1 Judd Creek Basin

The Judd Creek Basin is the largest on Vashon Island with a drainage area of 3,149 acres (King County 1998). Chum, coho, and chinook salmon are known to inhabit this basin (Kerwin et al. 2000). Judd Creek originates directly south of the Shinglemill Creek Basin and to the west of the Vashon Town Center, flowing at a moderate gradient toward Puget Sound. Rural residential development and agricultural/grazing land use practices are prevalent in the Judd Creek Basin and have influenced stream habitat conditions. Although activities in this basin have modified the landscape and habitat quality, Judd Creek remains an important salmonid stream with potential for improvement and increased fish production. However, further development of the basin threatens the integrity of the habitat and the future of the stocks that inhabit Judd Creek.

Suitable and valuable salmonid habitat exists in Judd Creek, but there are reaches that have been degraded (Figure 7-4). The basin is primarily a forested landscape with areas of rural residential and agricultural

development. Although development has altered the landscape, it has not resulted in a significant increase in EIA or substantial change in the hydrologic regime. However, the developed areas frequently encroach on the riparian habitat, so riparian habitat degradation is a frequent habitat impairment. Improvement of riparian habitat conditions in this basin should be a primary habitat restoration objective. The development has also resulted in several road crossings and culverts in the basin, none of which are passage barriers.

7.10.2 Shinglemill Creek Basin

Shinglemill Creek is 1,996 acres in size and the second largest stream basin on Vashon-Maury Island. The basin is one of the more pristine of the major streams on the island (Katy Vanderpool, King County, personal communication), and reaches of it may represent historical stream habitat conditions. Since development in the Shinglemill Creek Basin is limited, the habitat remains in good condition. Therefore, the stream is important for the production of salmonids.

The Shinglemill Creek Basin is composed of the main stem Shinglemill Creek (Subbasins 1, 3, and 4), Needle Creek (Subbasin 2), and numerous high-gradient tributaries. Shinglemill Creek originates in Fisher's Pond and flows north through a confined, moderate-gradient ravine to Puget Sound. Needle Creek is a high-gradient stream through much of its reach, but eases to moderate gradients that are inhabitable for fish as it approaches Shinglemill Creek. The steep ravines that contain the majority of the Shinglemill system have not been developed and remain forested. With the exception of infrequent encroachment of the riparian habitat in the upper basin, the riparian habitat is dominated by deciduous trees and in good condition. Large woody debris is abundant along much of the length of the stream, creating channel and habitat complexity, pools, and cover for fish. The well-vegetated banks are overhanging in some areas, which creates additional cover for fish. Mass wasting on the left bank at approximately RM 0.8 and the resulting sediment load to the stream is the only significant impairment to habitat conditions in the basin. Overall, Shinglemill Creek is in good condition and provides high quality habitat for salmonids.

The Shinglemill Creek Basin is an important habitat resource for the Vashon Island fishery. The basin provides habitat diversity that is essential for the spawning and rearing stages for multiple salmonid species. Although past land use practices likely degraded habitat conditions, the basin is on the mend. The steep ravine that contains the majority of the length of the stream is dominated by mature forest and the riparian habitat is healthy. These conditions have allowed the stream to recover and now provide a substantial length of valuable habitat (Figure 7-4). Although past land use practices still impact the stream, it appears that the mass wasting in the Grand Canyon appears to be a chronic habitat impairment for the lower portion of the basin (Figure 7-4) and should be addressed. The stream also lacks LWD in the lower mile of the stream, and may need augmentation. However, it is reasonable to allow the natural recruitment of LWD from the riparian habitat to supply the LWD in this reach.

7.11 CONCLUSIONS AND RECOMMENDATIONS

7.11.1 Fish Passage

Washington Trout (2001) completed a comprehensive survey of fish passage barriers on Vashon Island. Numerous culverts and bulkheads are passage barriers and should be repaired. Improving fish passage is critical to increasing the potential salmonid production on the island since removing the barriers would be a cost-effective way to gain miles of habitat. Some of these culverts have already been replaced by King County Roads. It is important to continue replacing culverts to improve habitat conditions on the island.

7.11.2 Bulkheads

Bulkheads at the mouths of streams exclude fish from entire stream basins. Washington Trout (2001) indicated that numerous bulkheads prevent fish passage into entire stream basins that might be able to support anadromous salmonids. In addition, these bulkheads prevent access to smaller streams that probably did not support fish populations, but may have provided juvenile over-wintering habitat. Removal of these structures would increase the amount of salmonid habitat on the island.

7.11.3 Water Diversions

There are numerous water diversions on Vashon-Maury Island, many without screens to prevent fish from entering the systems. Screens need to be installed on all water diversions to avoid fish entry into these systems and resulting mortality.

7.11.4 Riparian Habitat Restoration

Land use practices on Vashon-Maury Island have degraded riparian habitat conditions. Residences and livestock pastures frequently encroach on the riparian corridor, resulting in the degradation or complete removal of riparian vegetation. A healthy riparian habitat is an essential component of quality stream habitat (Murphy and Meehan 1991), therefore the following actions should be undertaken where possible:

- Install stream fencing to exclude livestock grazing in the riparian corridor, allowing riparian vegetation to regenerate.
- Plant riparian areas with native trees and shrubs to expedite the recovery process.
- Work with landowners to replace ornamental plants with native shrubs and trees in the riparian corridor to expedite the recovery process and restructure the vegetation community.
- Work with landowners to implement agricultural and rangeland best management practices (BMPs) to minimize or eliminate the effects of land use activities.

This is a programmatic recommendation that will require working with landowners to restore riparian conditions where they have been degraded.

7.11.5 Shinglemill Creek Mass Wasting

The mass wasting at RM 0.8, known as the “Grand Canyon” appears to have significantly increased the sediment load to Shinglemill Creek and impaired substrate conditions. Measures need to be taken to cease further erosion in the Grand Canyon and prevent the transport of sand and fine substrates to the stream.

7.11.6 Stream Channelization

The WRIA 9 report indicated that numerous stream channels have been channelized, confined, or contained in culverts by private property owners. These areas should be restored to more natural conditions.

7.11.7 Protection of Natural Hydrology

Further development of Vashon-Maury Island would likely alter the hydrology of the streams on the island, posing a risk to the stream habitat. An altered hydrology could lead to channel incision, erosion,

and transport of sediment to critical habitat areas. It is imperative that BMPs be used to minimize the effects of any island development on hydrology.

7.11.8 Data Needs

Quantitative information on Vashon-Maury Island streams is limited. The Washington Trout (2001) report identified the following data gaps:

- Water quality data are limited. Metals data is only for total metals. There are no data available for storm conditions. Gaining further knowledge of water quality on the island may identify pollution sources and is a necessary step in improving island conditions.
- There is not a comprehensive baseline habitat survey for all island streams. A detailed assessment of habitat conditions is needed for further evaluation of habitat improvement opportunities. Collection of these data would provide insight on the relative condition of the streams, which would be useful for establishing target conditions for habitat restoration projects.
- The loss of habitat from channelization has not been quantified. This information should be collected simultaneously with detailed habitat inventories. These data would identify and quantify channelized reaches, allowing for a prioritized approach to restoring such reaches.
- Minimum in-stream flows have not been determined for streams where water withdrawals occur. An island-wide investigation of legal and illegal surface water withdrawal is needed to examine the impacts of surface and groundwater withdrawals on stream subbasins and effects on salmonids. Low-flow monitoring projects on these streams should also be performed to evaluate the effects of water withdrawals on the fishery.
- There is no quantitative information on the effects of the mass wasting and increased sediment load on Shinglemill Creek. A comparative investigation of stream habitat and substrate composition upstream and downstream of the mass wasting area should be conducted as the first step toward a solution to this problem. If the study indicates that the effects of the sedimentation are significant, then strategies to stop this erosion process should be pursued.

Filling these data gaps would provide a more thorough knowledge of habitat conditions and identify specific areas that may need restoration or are suitable for preservation.







